

6.1

Polygons

Goal Identify and describe polygons. Find angle measures of quadrilaterals.

VOCABULARY

Polygon, side, vertex A polygon is a plane figure that is formed by three or more segments called *sides*. Each side intersects exactly two other sides at each of its endpoints. Each endpoint is a *vertex* of the polygon.

Diagonal of a polygon A segment that joins two nonconsecutive vertices of a polygon is a diagonal of the polygon.

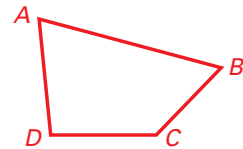
Follow-Up

Draw any polygon $ABCD$.

Name all the vertices. A, B, C, D

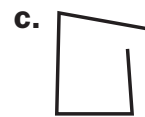
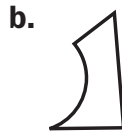
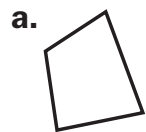
Name all the sides. $\overline{AB}, \overline{BC}, \overline{CD}, \overline{DA}$

Name all the diagonals. $\overline{AC}, \overline{BD}$



Example 1 Identify Polygons

Is the figure a polygon? Explain your reasoning.









Solution

a. Yes. The figure is a polygon formed by 4 straight sides.

b. No. The figure is not a polygon because it has a side that is not a segment.

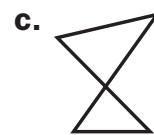
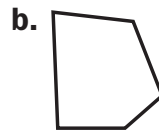
c. No. The figure is not a polygon because two of the sides intersect only one other side.

Follow-Up For each type of polygon, write the number of sides. Then sketch the polygon described.

Triangle <u>3</u> sides		Hexagon <u>6</u> sides	
Quadrilateral <u>4</u> sides		Heptagon <u>7</u> sides	
Pentagon <u>5</u> sides		Octagon <u>8</u> sides	

Example 2 Describe Polygons




Decide whether the figure is a polygon. If so, tell what type. If not, explain why.



Solution

- a. Yes. The figure is a polygon with 4 sides, so it is a quadrilateral.
- b. Yes. The figure is a polygon with 5 sides, so it is a pentagon.
- c. No. The figure is not a polygon because some sides intersect more than two other sides.

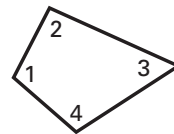
✓ **Checkpoint** Decide whether the figure is a polygon. If so, tell what type. If not, explain why.

1.  No; two sides intersect only one other side.	2.  Yes; pentagon	3.  No; it has one side that is not a segment.
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THEOREM 6.1: QUADRILATERAL INTERIOR ANGLES THEOREM

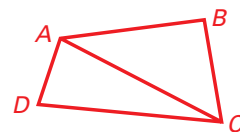
Words The sum of the measures of the angles of a quadrilateral is 360°.

Symbols $m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 = \underline{360}^\circ$



Follow-Up Draw quadrilateral $ABCD$ and divide it into two triangles by drawing diagonal \overline{AC} .

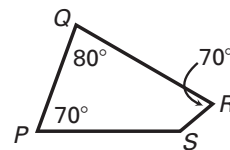
The sum of the angle measures of $\triangle ABC$ is 180° and the sum of the angle measures of $\triangle ACD$ is 180°.



So, the sum of the angle measures of $ABCD$ is 180° + 180° = 360°.

Example 3 Find Angle Measures of Quadrilaterals

Find the measure of $\angle S$.



Solution

$$m\angle P + m\angle Q + m\angle R + m\angle S = \underline{360}^\circ$$

$$\underline{70}^\circ + \underline{80}^\circ + \underline{70}^\circ + m\angle S = \underline{360}^\circ$$

$$\underline{220}^\circ + m\angle S = \underline{360}^\circ$$

$$m\angle S = \underline{140}^\circ$$

Quadrilateral Interior Angles Theorem

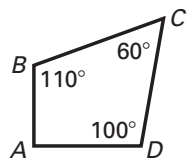
Substitute angle measures.

Simplify.

Solve for $m\angle S$.

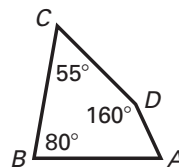
✓ **Checkpoint** Find the measure of $\angle A$.

4.



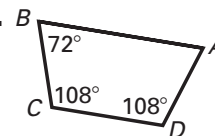
90°

5.



65°

6.



72°